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VENUS AEOLIAN GEOLOGY AND GEOLOGIC MAPPING

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by

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Objectives

The goals of this investigation were to determine the geological characteristics of aeolian features on Venus and to relate the features to the patterns of atmospheric circulation and the general geology where aeolian features occur. This study utilized a global data base of >5000 aeolian features that includes their morphologic classification and geographic location. Although the primary aeolian features studied were various wind streaks, other features include dune fields and possible yardangs. The origin and evolution of these features were studied and the potential sources of windblown sediments were assessed.

In addition, this study involved geologic quadrangle mapping on Venus, as part of a National Aeronautics and Space Administration U. S. Geological Survey project. In this task, the PI also served on the science steering group to oversee the project.

Background and Relevance

Aeolian (wind-related) processes on Venus have been debated for more than a decade (Sagan, 1975, Hess, 1975), and many investigators predicted that aeolian features would eventually be found (reviewed by Greeley and Arvidson, 1990). Although images of the surface returned from Soviet Venera landers and measurements of near-surface winds suggested local modification of the surface by wind, definitive evidence for more widespread aeolian activity was not observed until the Magellan mission (Saunders et al., 1991). Preliminary analyses of Magellan radar images revealed several regions where wind-related features are abundant, as well as in other isolated occurrences (Arvidson et al., 1991). Aeolian features include possible dune fields, yardangs (wind-eroded hills), and various types of wind streaks (surface patterns of contrasting radar backscatter cross sections), as outlined by Greeley et al. (1992a, and Appendix 2).

Aeolian features provide direct evidence for the interaction of the atmosphere with the surface. The presence of depositional aeolian features, such as dunes, shows areas where particles capable of movement by the wind occur and gives indications of weathering processes. The identification of the type and orientation of aeolian features provides clues to the physical properties of surface materials where they occur and the wind direction at the time of their formation.

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Greeley, R., R.E. Arvidson, C. Elachi, M.A. Geringer, J.J. Plaut, R.S. Saunders, G. Schubert, E.R. Stofan, E.J.P. Thouvenot, S.D. Wall, and C.M. Weitz, Aeolian features on Venus: Preliminary Magellan results, *J. Geophys. Res., 97,* 133,319-13,345, 1992.

Hess, S.C., Dust on Venus, *J. Atmos. Sci., 32,* 1076-1078, 1975.

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Results

The attached papers give the results of this investigation.

Greeley, R., K. Bender. D. Senske, and J. Guest, The Carson Quadrangle, Venus, *Lunar and Planetary Science Conference, 25,* 463-464, 1994.

Greeley, R., G. Schubert, D. Limonadi, K.C. Bender, W.I. Newman, P.E. Thomas, C.M. Weitz, and S.D. Wall, Wind streaks on Venus: Clues to atmospheric circulation, *Science, 263,* 358-361, 1994.

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Senske, D., R. Greeley, and K. Bender, Radar characteristics of geologic units in the Carson Quadrangle, Venus, *Lunar and Planetary Science Conference, 25,* 1243-1244, 1994.

Weitz, C.M., J.J. Plaut, R. Greeley, and R.S. Saunders, Dunes and Microdunes on Venus: Why were so few found in the Magellan Data?, *Icarus, 112,* 282-295, 1994.